5 Color Tuned Printing

How to set up your printer for better prints

- What you need to know about printer profiles
- How to check if your printer and the printer driver are working properly
- What to observe when working with a spectrocolorimeter
- Instructions on measuring technique

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User-Created Printer Profiles

If your monitor displays colors consistently and accurately, then profiling the printer is the next step. Unlike monitors, printers are relatively consistent over time. The only exceptions requiring reprofiling are changes in your ink or media, or print head wear.

INFO

Profiling works only as long as you work with the same inks and the same paper that has been used during the profiling process; and these materials remain consistent. Manufacturers are getting better, over time, about not changing paper coatings or ink formulations without warning users, but it does happen.

Typically, glossy photo papers are used when printing photos on ink-jet printers; matte art papers or canvas are used for fine art prints; and proofing papers are used for simulating offset printing results. These differing paper types are mixed and matched as needed. For example, a photographer could use a photo-gloss paper for a customer's prints, then work with handmade paper to print the same images for their own portfolio or gallery prints.

INTERESTING ONLINE FINDS

For more insights we recommend to visit John Paul Caponigro blog post 17 Top Printing Tips For Making Great Fine Art Prints

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Why do you need profiles for different types of paper?

You must create profiles for the types of paper when working with different papers on a high-quality photo printer. It is not enough to simply define profiles for smooth, matte and uncoated paper. You need separate profiles for the slightest differences in paper type or coating. Why is that? Just think about how differently a drop of ink acts on open-pore newsprint in contrast to resin-coated photographic paper. Once the drop contacts the photo paper, it retains its shape and stays at the surface. On newsprint, the drop sinks in and expands to a spot with imprecise edges. You must consider these differences multiplied a thousand times when creating profiles. In addition, four, six or even eight colors merge with each other. This gives you an idea of what occurs during the printing process and why tiny differences between paper coatings can have a significant effect on the resulting color and density.

What effect does the ink have?

Do not forget the influence of the ink on the color. The printer's original ink often produces more powerful colors than third party ink. Varying inks react differently depending on the assorted types of paper, as well.

EXAMPLE

If you work with four different types of paper and two types of ink on two different printers, you need a total of 16 printer profiles. Profile needs multiply quickly!

Why the printer-ink-paper combination is relevant

For beginners, the easiest way to work is with OEM inks, the OEM papers, and the printer manufacturer's supplied profiles. These are perfectly suited to each other (at least with a relatively new printer), and they provide relatively reliable results in combination with a calibrated monitor.

However, if you want to get the best results from your printer and it does not come with profiles, or you are using ink and/or specialty paper from other suppliers, or age has changed the print heads or media combinations, you must create profiles yourself. Custom tuning profiles for softproofing and image editing for a given printer is another reason for custom profiling. There are free profiles online that can be downloaded for some printer/paper combinations and they improve results. Nevertheless, the most accurate results are achieved with user-created profiles. These take into account the individual properties of your own printer and can be adjusted as needed. This is the most precise way to perform color correction for the printer.

A step-by-step guide to printer adjustment

The technical procedure for the printer profiling is simple. You print out a special target image and then read the printed colors, and the target values are compared with the actual values using special software, resulting in a printer profile. Pre-print image adjustments and final printing is then done using this profile.

Professionals rely on the precision of profile creation and work with a spectrocolorimeter or spectrophotometer to create printer profiles. We describe this approach in detail on the following pages. Depending on the precision requirement, measurement charts can be printed with 225 or 729 color patches, plus 238 gray scale patches to increase the measurement density around the gray axis. Following a drying time of about 30-60 minutes, the printed color targets are measured with a spectro, such as SpyderPRINT.

Some effort is required to create custom printer profiles. The color targets must be measured strip by strip.

SpyderPRINT has a minimum requirement of Windows 7 or macOS 10.7. Following installation, you can launch SpyderPRINT from your applications folder. Its best to let the program automatically check for updates, to ensure you're working with the latest version.

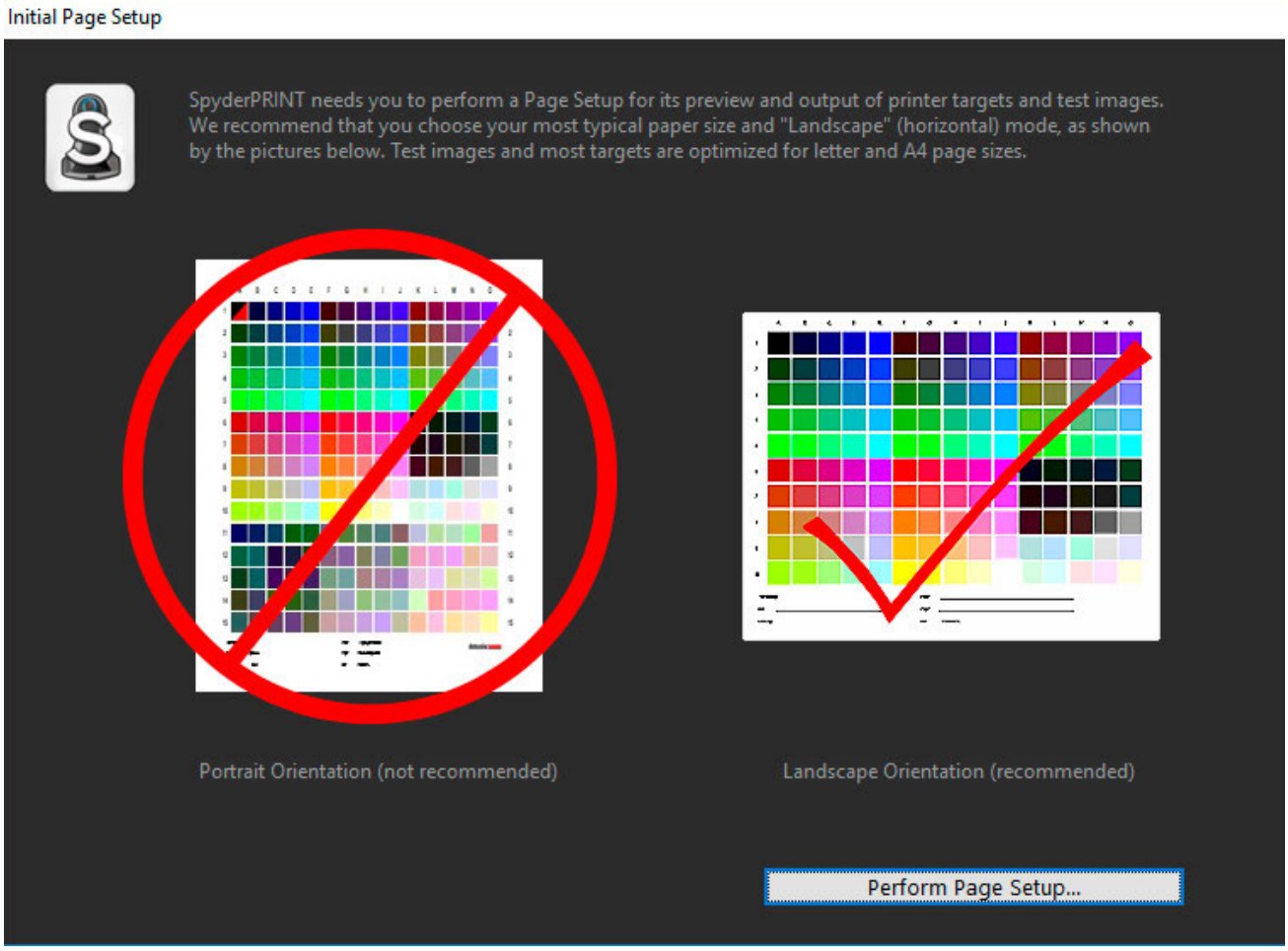
EXPERT INSIGHT

There are a number of reasons your print shows differences compared with your monitor, despite careful printer profile creation. For example, many monitors show open shadows when running at high brightness. You can reduce the brightness during calibration to a reasonable level (120 candela is ideal). A monitor has completely different contrast characteristics than paper. Enable the "Simulate Paper Color" softproofing option in Photoshop to make your monitor more closely emulate the paper. The Softproof feature in Spyder5ELITE+ automatically simulates paper color and contrast.

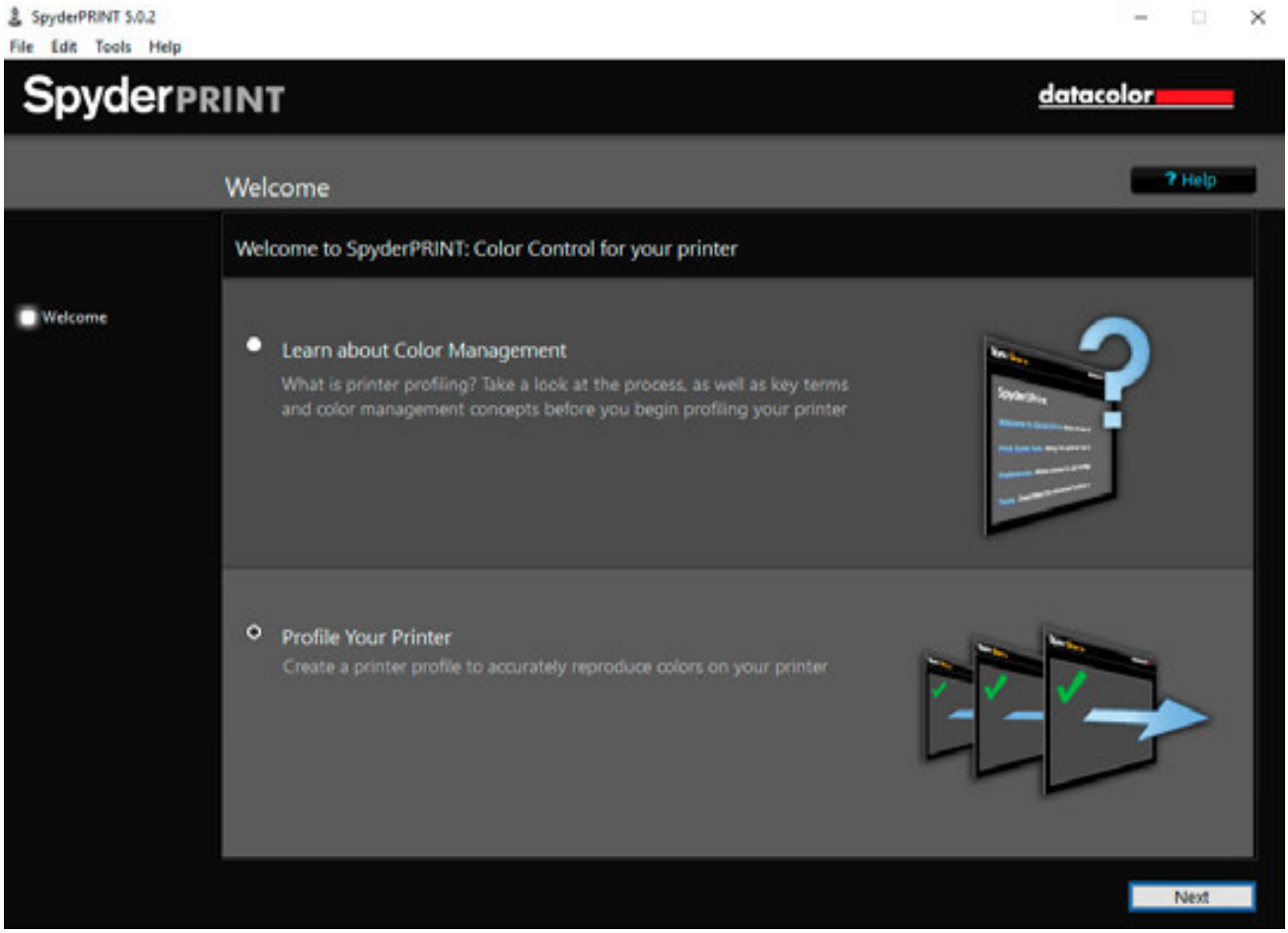
Page setup

Here's how easy it is

During initial setup, the software prompts you to set the page orientation of your printer to the landscape orientation. This ensures the optimum size of the color patches and makes strip reading easier. In the second step, you can choose between a primer on printer color management or the start of the profile creation wizard, which leads you step-by-step through the printing and color measurement process.


Initial Page Setup
SpyderPRINT needs you to perform a Page Setup for its preview and output of printer targets and test images.
We recommend that you choose your most typical paper size and "Landscape" (horizontal) mode, as shown
by the pictures below. Test images and most targets are optimized for letter and A4 page sizes.
Portrait Orientation (not recommended)
Landscape Orientation (recommended)
Perform Page Setup...

Step 1: Initial page setup: the menu navigation is intuitive and simple


SpyderPRINT 5.0.2
File Edit Tools Help
SpyderPRINT
datacolor
Welcome
Help
Welcome to SpyderPRINT: Color Control for your printer
Welcome
Learn about Color Management
What is printer profiling? Take a look at the process, as well as key terms and color management concepts before you begin profiling your printer
Profile Your Printer
Create a printer profile to accurately reproduce colors on your printer
Next

Step 2: Continue your profiling process by choosing Profile Your Printer.

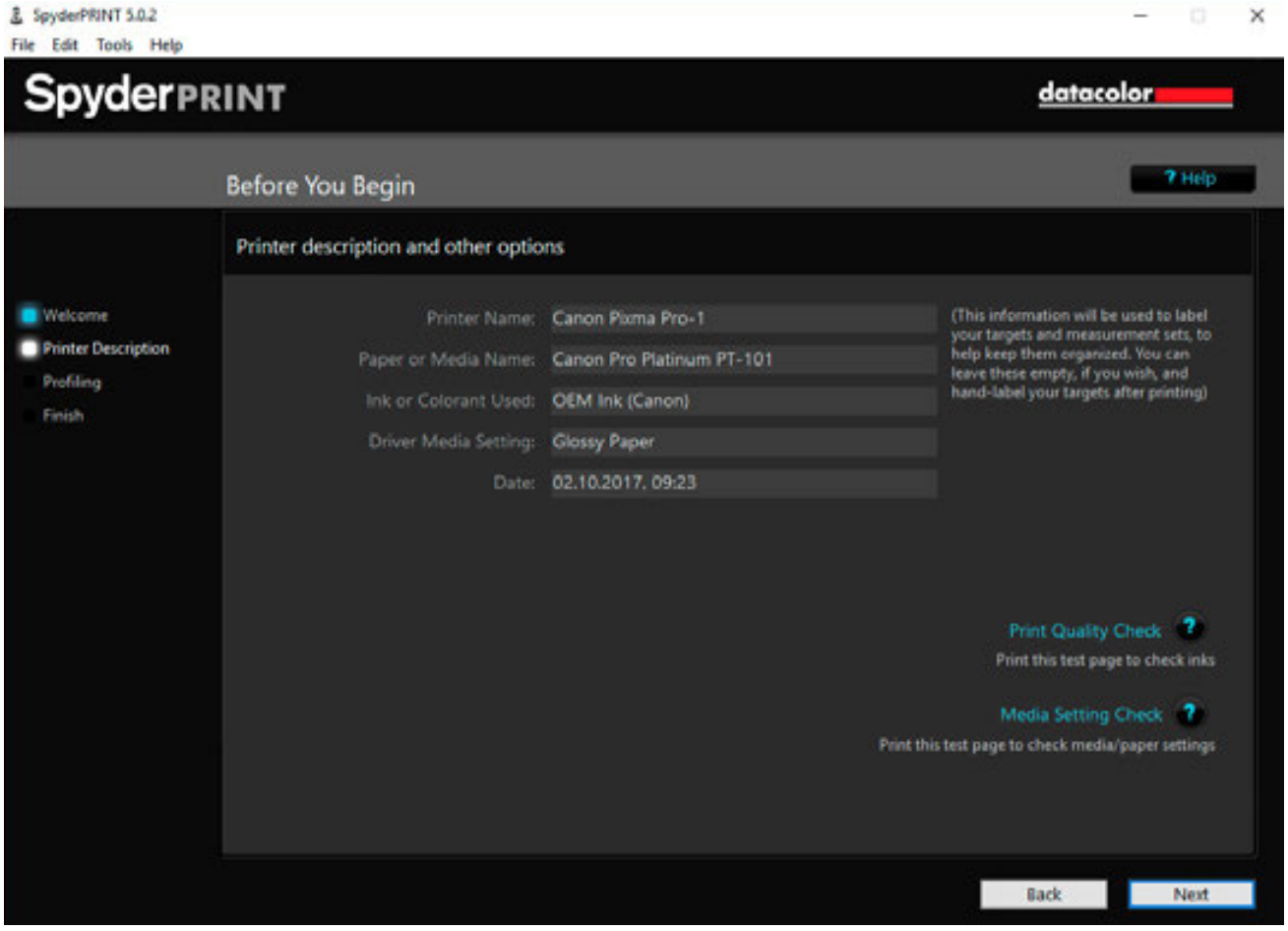
Printer Selection

What you need to know

When selecting the printer, you enter the information that is important for the planned target print, which will be displayed later on the printout. Normally, it is sufficient to specify the following three key details:

- What **printer**?
- What **paper**?
- What **inkset**?

Important: The date and time are supplied by the operating system.


SpyderPRINT 5.0.2
File Edit Tools Help
SpyderPRINT
datacolor
Before You Begin
? Help
Printer description and other options
Welcome
Printer Description
Profiling
Finish
Printer Name: Canon Pixma Pro-1
Paper or Media Name: Canon Pro Platinum PT-101
Ink or Colorant Used: OEM Ink (Canon)
Driver Media Setting: Glossy Paper
Date: 02.10.2017, 09:23
(This information will be used to label your targets and measurement sets, to help keep them organized. You can leave these empty, if you wish, and hand-label your targets after printing)
Print Quality Check
Print this test page to check inks
Media Setting Check
Print this test page to check media/paper settings
Back
Next

This information is used to label both targets and resulting profiles.

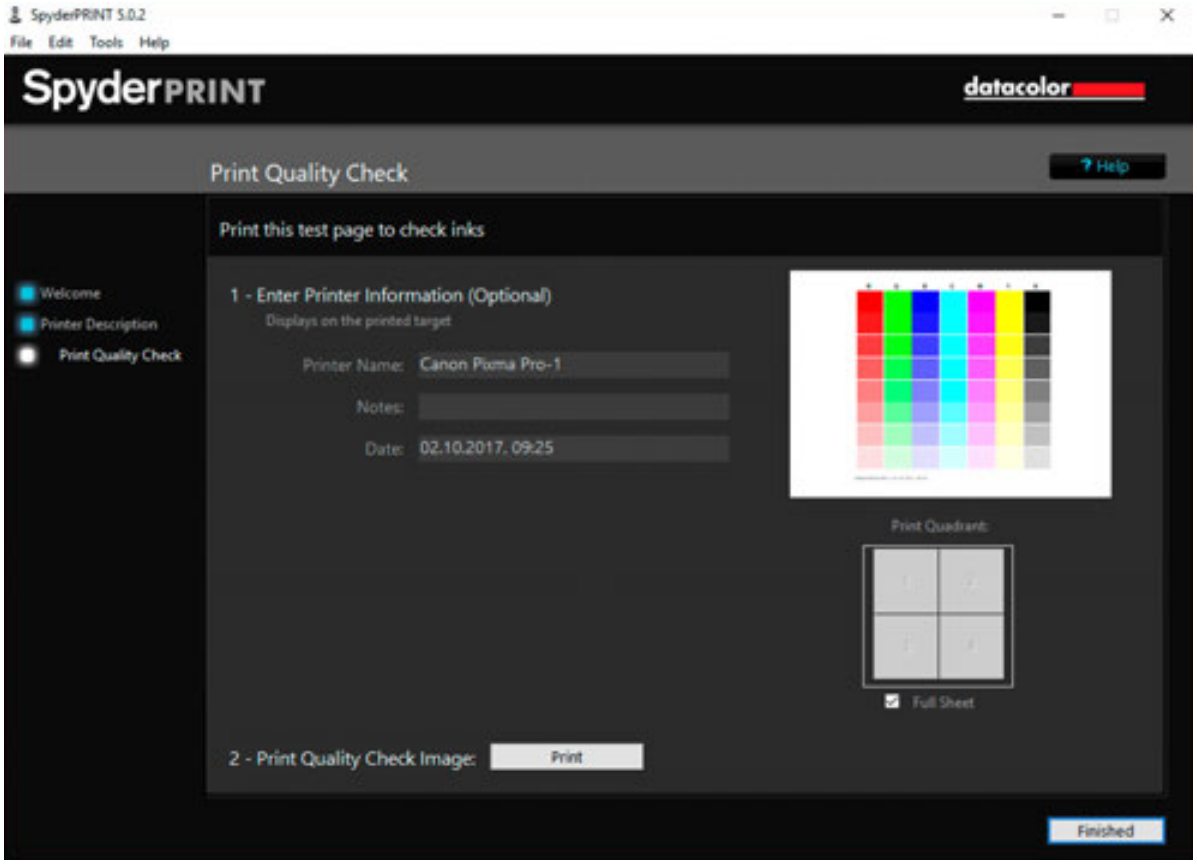
INFO

If you profile regularly and routinely, click the “Next“ button. This will skip the following two dialogs.

Print Quality Check

What this test will teach you

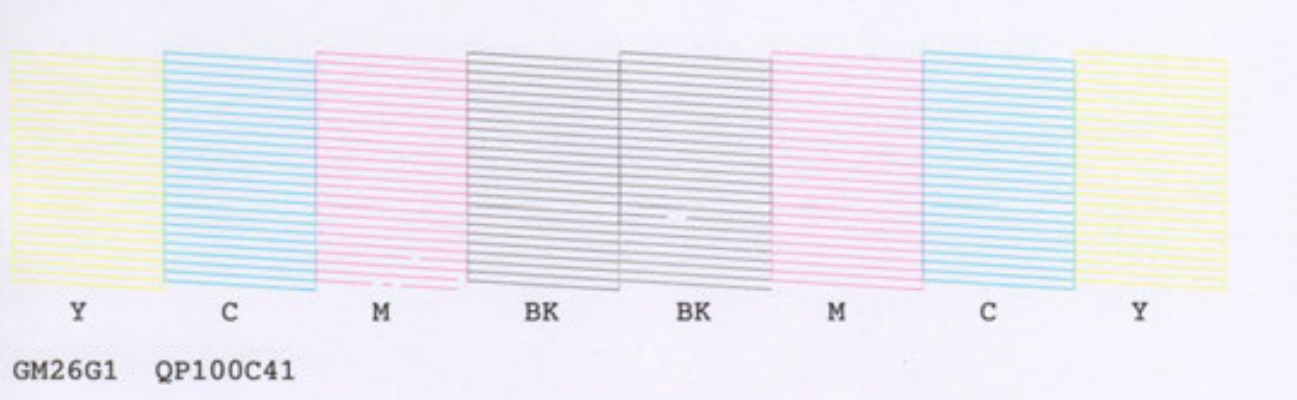
If you have not printed for a prolonged period of time, it is worthwhile to make a quality test print before creating the profiles. This is how you recognize problems beforehand. You can print either on the whole page or in one section of it. The latter allows multiple prints on a single sheet of paper, saving materials.



User interface “Print Quality Check.” Click on the test chart to enlarge the image.

INFO

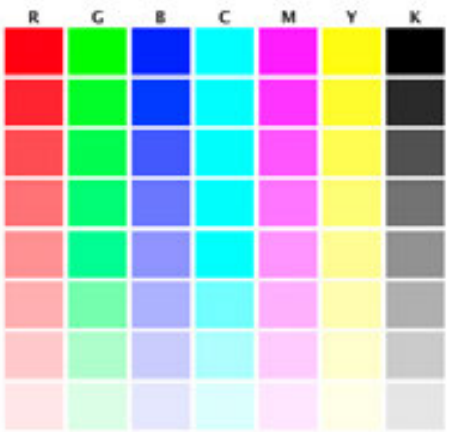
The most precise jet test is the nozzle check in your printer driver. Here, the nozzles are individually checked and a nozzle step pattern is created. This shows very clearly if a nozzle is blocked and if nozzle cleaning must be carried out. However, entire colors can sometimes be missing from this print at either end, without the user being aware of it.



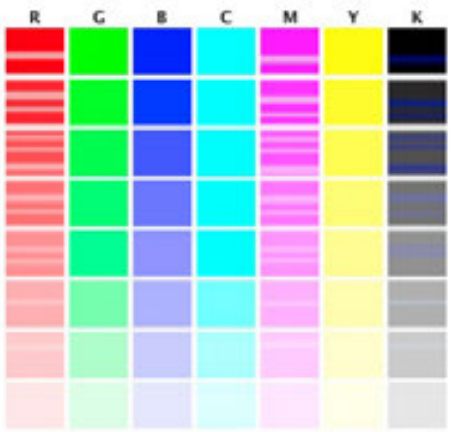
A typical example of an inkjet test chart, as provided by printer manufacturers.

Determining irregularities in prints using a SpyderPRINT test chart

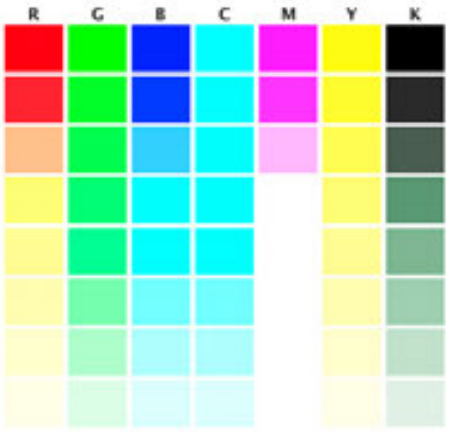
In case you notice irregularities when printing the test chart, please try to rectify them by using the print driver's cleaning command; or if needed and available, the deep cleaning option.



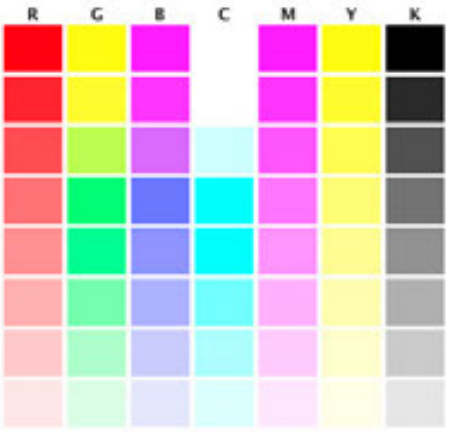
Correct quality check print - no skips, no missing ink colors



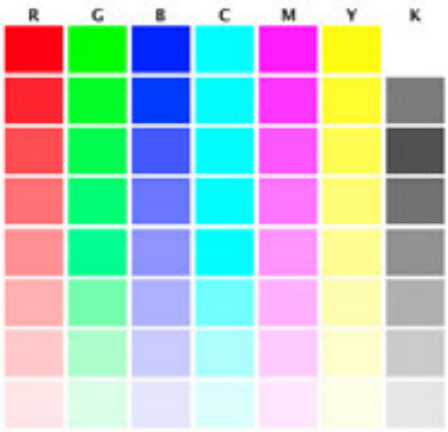
Quality check print with misfiring jets



The image above illustrates the type of result you would see with the light magenta ink empty or not printing. Note that only part of the magenta ramp is blank, and that the color of other (secondary) ramp is also affected.



The image above illustrates the type of result you would see with the dark cyan ink empty or not printing. Note that it effects far less of the print than a light ink failure. It is important to look at the color initials at the top of the check print and be sure that they match the colors printed below them; here they do not.



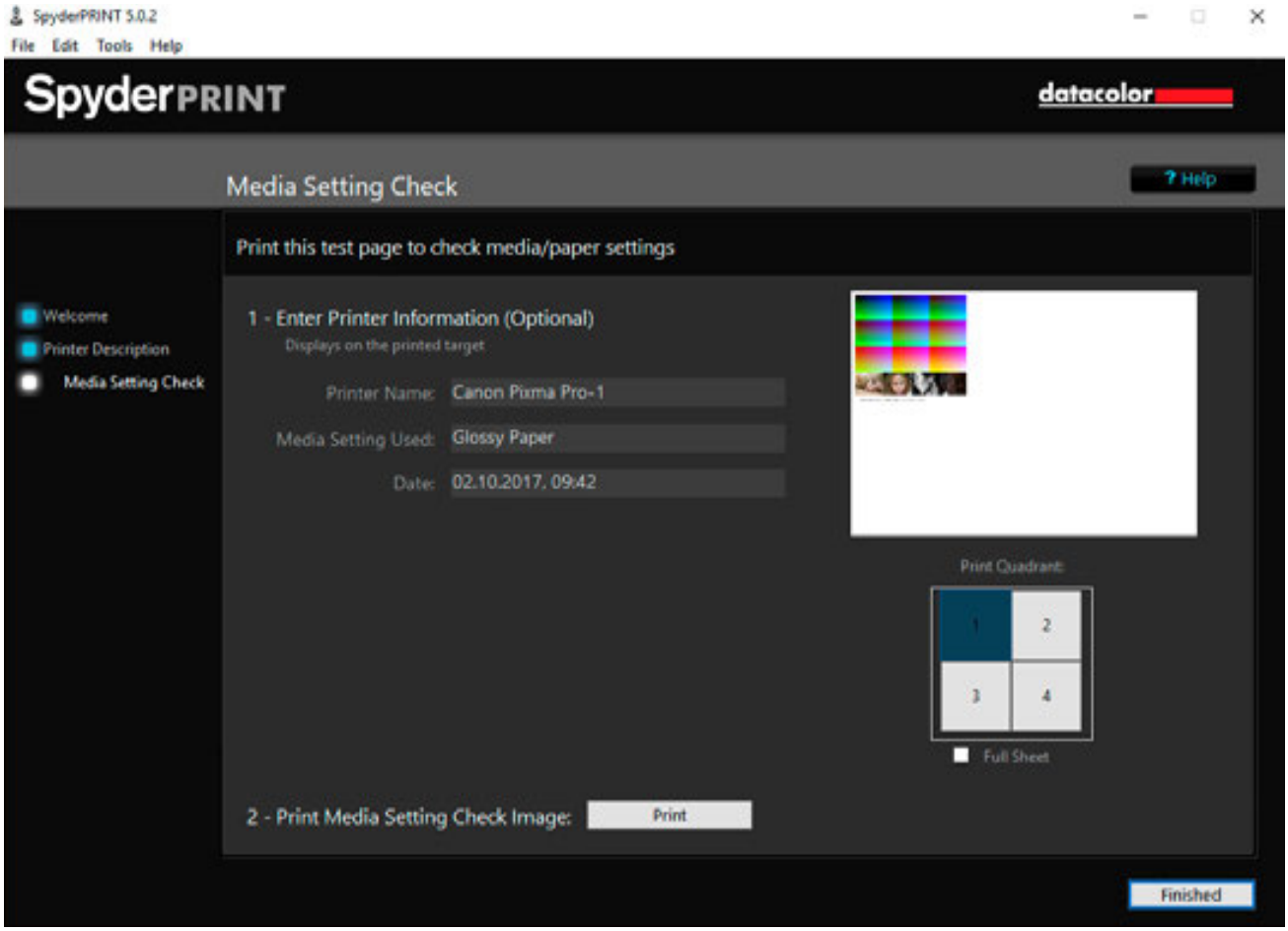
The image above illustrates the type of result you would see with the black ink empty or not printing. Note that it affects far less of the print than either a light or dark Ink failure. Printer problems with light black inks can be difficult to detect. Pay attention to the 'K' ramp to ensure that it gradates properly.

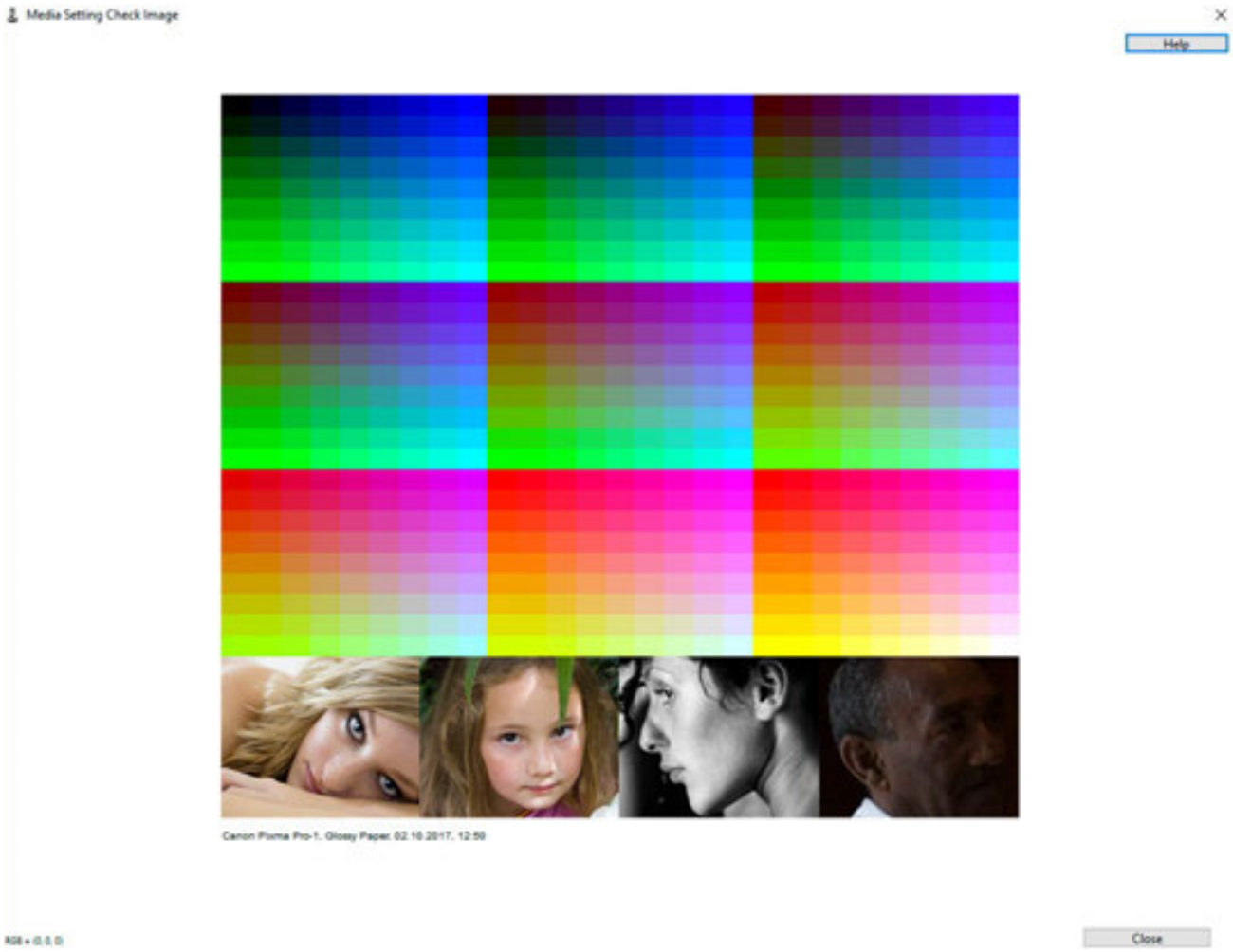
The image above illustrates the type of result you would see if the jets were misfiring, and therefore printing color in areas that should be white. While it is worth cleaning a printer that is showing these symptoms, it is likely that you will need to replace the print heads.

Media Setting Check

How best to do this

Your printer driver provides the option to select appropriate settings for different media types. With the Media Setting Check, you can print up to four test prints to one sheet. This allows you to see which default paper type setting gives the best print in terms of the amount of ink used. The best media preset is not always the one with the most obvious name. You should also try out presets that seem counterintuitive, such as "semi-gloss" for semi-matte paper. For visual evaluation, look for too high or too low color application to exclude driver presets.



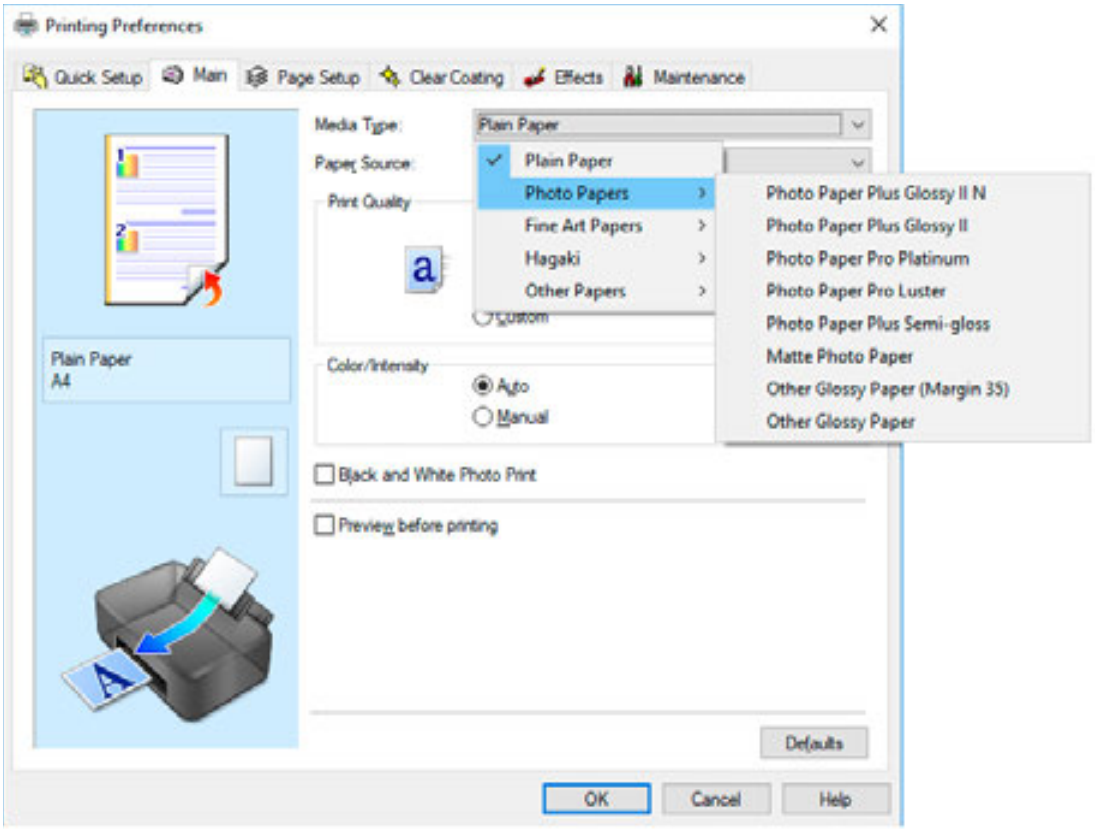


User interface “Media Setting Check.” Click on the test chart to enlarge the image.

To generate four test prints on one piece of paper:

Click on the first quadrant in the section “Print Quadrant”

- Enter the driver media type used in the text box. To do so, open the print driver and check the media type dropdown list
- Load your preferred paper and start a test print
- Go back to Print Quadrant and chose the next quarter to print on
- Again, click on “Print” and adjust the media type in your print driver. Type the name of the media type chosen in the text field “Media Setting Used”.
- Load the same piece of paper in the same orientation and start the print job
- You can repeat this process up to four times per sheet



By referring to this Canon print driver, one gets an idea of the plethora of papers available to choose from. The naming doesn’t follow a standard. It may be necessary to do several test runs with different media type settings in order to decide on the optimal setting for the selected paper.

Once you get through four print runs, you'll have four test charts for varying media type settings on one sheet of paper. The entered information indicates what setting each represents, taking the guesswork out of selecting a media setting.

TIP

Color density slider: some inkjet printers come with a color density slider, allowing for adjustment of the overall density of ink. Since these printers generally aim for good color density, you usually do not need to adjust this slider's settings for great printing results. This also means not having to remember the slider's settings and adjust when printing. When using custom profiles most print driver setting options are deactivated – with the exception of the color density slider – once color correction options are selected.

How to check test prints

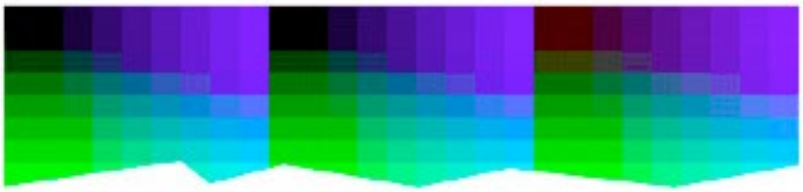
The optimal media setting for profiling and printing on a particular paper may not be the media setting with the most likely name. It is worth testing a range of media settings to determine which one will actually perform best with your combination of settings, colorants, and media. The "Media Setting Check Print" shows the entire color universe of your printer, colorant, and media combination in nine slices of nine steps by nine steps. You can print this image at different driver media (paper type) settings to assist you in determining which is most suitable for your combination of printer, colorant, paper, and settings. Photographic content is included at the bottom of the check print to assist in determining the photographic qualities of different media settings. Different media settings will lay down different densities of ink in the various sections of the check print, and offer varying degrees of linearity (consistency) in the steps between adjacent patches. Printers that offer smoother, more linear, gradients in the check print require fewer patches in the final profiling target. Printers with significant local variations require more patches to profile effectively.

INFO

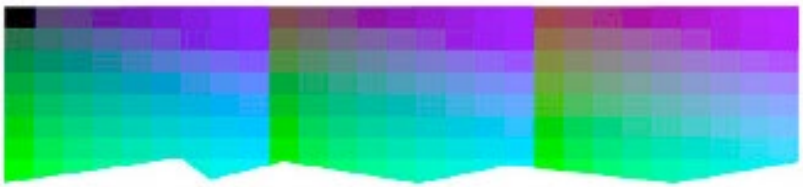
These test charts are not involved in profiling a printer. They are solely used for visual determinations of optimal media settings.

Near black colors

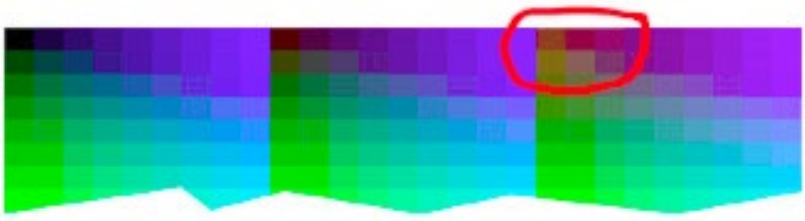
Near black patch locations: a smooth gradation to black, this is ideally what you want to see.



Clogged near blacks: avoid settings that print too many near black patches, blocking up entire groups of patches.



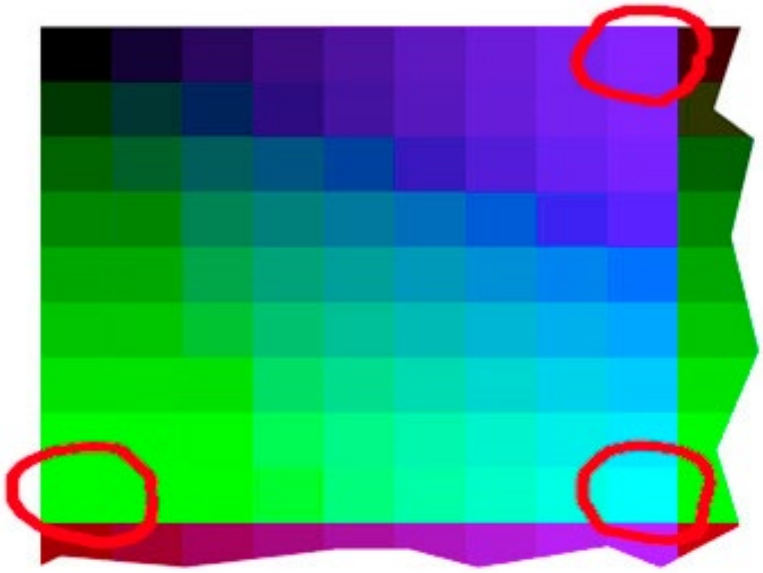
Weak near blacks: avoid settings that have a lack of near black patches, jumping directly to medium grays from black.



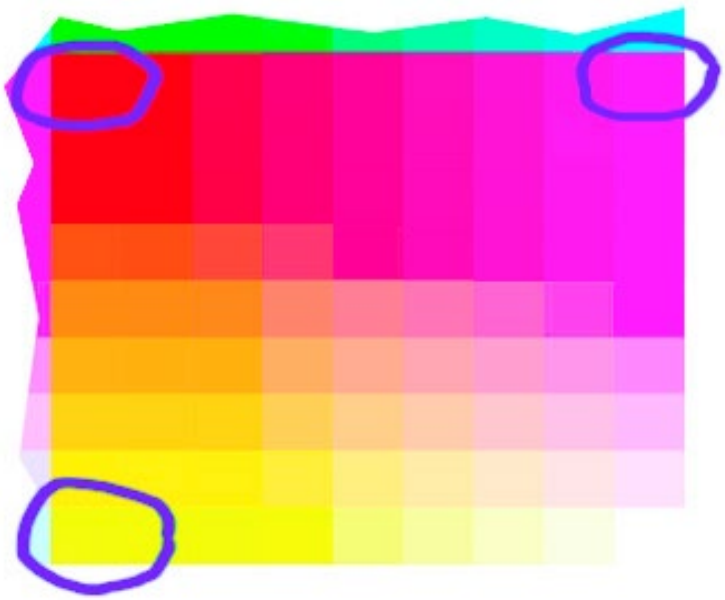
Off-color near blacks: avoid settings that have excessively off-color near black patches, often occurring in the third section. This is not as significant as other black issues, but should be considered.

Primary colors

Check how your printer, colorant, and media combination work with the particular media setting to create near primary colors. The primary and secondary colors, circled in these images, may vary with different media settings.



Green, cyan, and blue primaries occur in the same section as black



Yellow, red, and magenta primaries occur in the same section as white

Comparing Settings

To compare a range of media settings, look for the following elements:

- Bright primary colors, without over-inking
- Good color range and brightness in other colors in the image
- Good gradation from primary colors into the rest of the color space

This image shows a good gradation from blue to black, with distinct patches throughout.

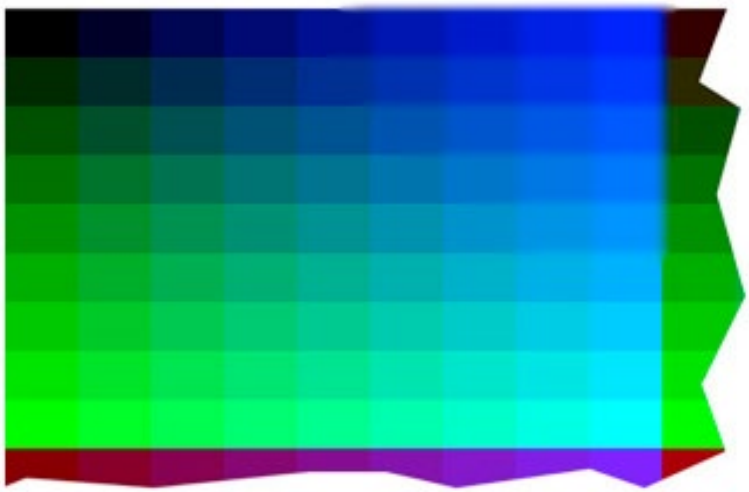
This image shows a problematic gradient from blue to black, with excess inking, which causes several of the patches to print full blue, with no visible steps. A media setting that causes results such as this is best avoided, even though it offers bright primaries.

This image shows a problematic gradient between blue and green, which results in a visible stairstep pattern. This type of break is not as undesirable as over-inked primaries, but should be avoided if possible.

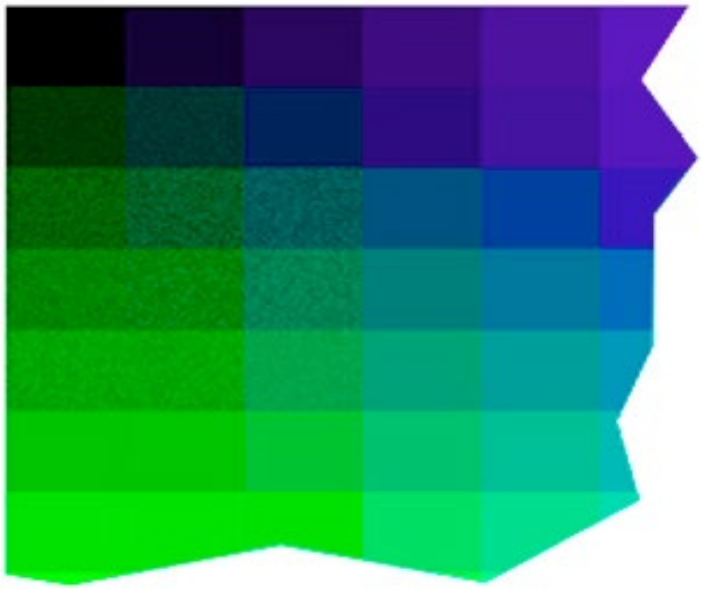
Inking Issues

There are a range of possible inking issues that a particular combination of printer, colorant, and media may cause. Inking issues assume that you are using an ink-based printer, though excess colorant and other related issues are also possible with other printer types. Look for the following signs:

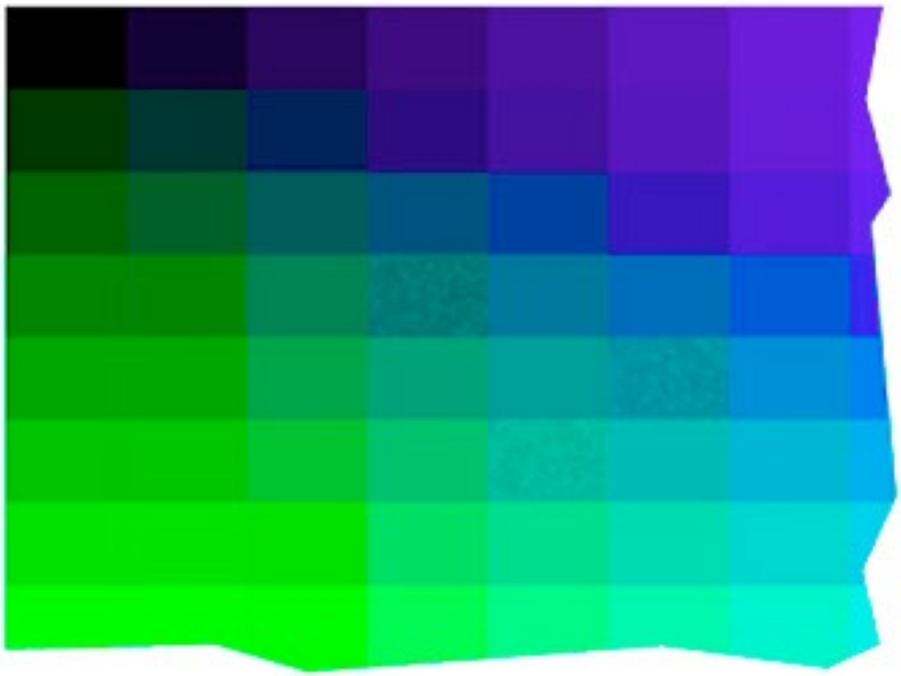
- Over-inking, is most commonly noticeable as lack of patch distinction, as shown above, but also results in many of the other problems noted below.
- Bleeding of inks outside their patch boundaries, blurring one patch to another, or bleeding into the white surround.



Here the blue areas have bled between patches and beyond the edge of the chart.



Mottling of inks within patches, showing grainy, uneven areas where the ink is heaviest, often where two or more colors are mixed at high-ink levels. This illustration shows what mottling might look like if it occurred where dark cyan, yellow, and black inks were all being used to create deep greens.



Worming may look similar to mottling, but it occurs within the dither pattern of the printer. Larger, often worm-like, shapes may occur in the printer's dithering pattern in certain flat color patches. Worming affects only flat color areas, so it typically does not cause problems in photographic images, unless flat areas such as clear skies display the problem.

Further Effects

- Bronzing is an effect that can be caused by excess ink in the near blacks. Bronzing occurs as a difference in color tone between black and near black areas of a print when viewed at an angle to the light source, often showing a bronze sheen. In some cases, the only solution to bronzing is choosing a different paper or inkset. In other cases, a lighter inking media setting can improve results.

- Gloss differential is similar in nature to bronzing, but occurs in the lighter areas of prints. It is a difference in the glossiness of uninked paper and adjacent inked areas. It is only an issue with gloss and luster surfaces. A few printer models offer a gloss optimizer option, which applies an unpigmented ink to blank areas to reduce gloss differential. Other modern printers utilize high-gloss inks, which also minimize the difference in gloss between printed and unprinted areas. Gloss differential cannot be controlled through choice of media settings, nor through using ICC profiles. If your gloss and luster prints exhibit gloss differential, and you find it undesirable, then consider changing papers, inks, or printers to find a more acceptable result; or spray your prints with a quality archival fixative overspray after printing. This reduces gloss differential, while at the same time providing increased water resistance, and in most cases longer print life.

Analyzing Photo-Content

The photo content in the “Media Setting Check Print” allows for checking how well a media setting’s gradations and densities represent photographic content. A color cast is not important here, as that can be corrected with the profiling process, but problems with blown out highlights, over-inked dark areas, or posterization (visible steps where none should be present) are more difficult for a profile to compensate for.

The above image shows good photo content.

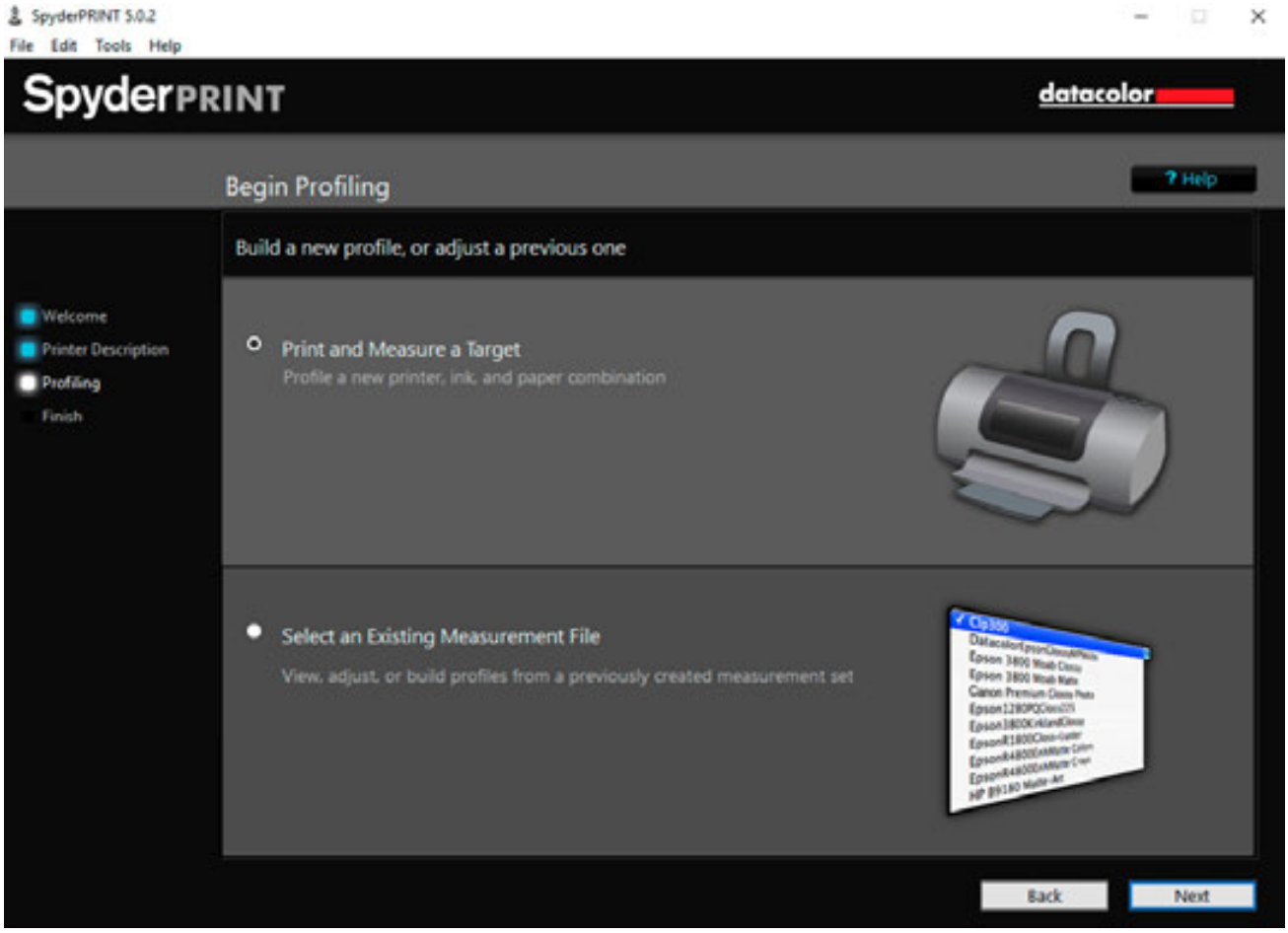
This version of the photo content shows blown out highlights.

This version of the photo content shows clogged shadows.

This version of the photo content shows posterization.

The Profile Creation Process

Initiating profile creation



What options do you have?

After checking that your printer, and possibly the printer driver, are working properly you can decide in this dialog:

- if you want to print out the target and then measure it, or
- if you want to access a an existing measurement file for completion or reworking.

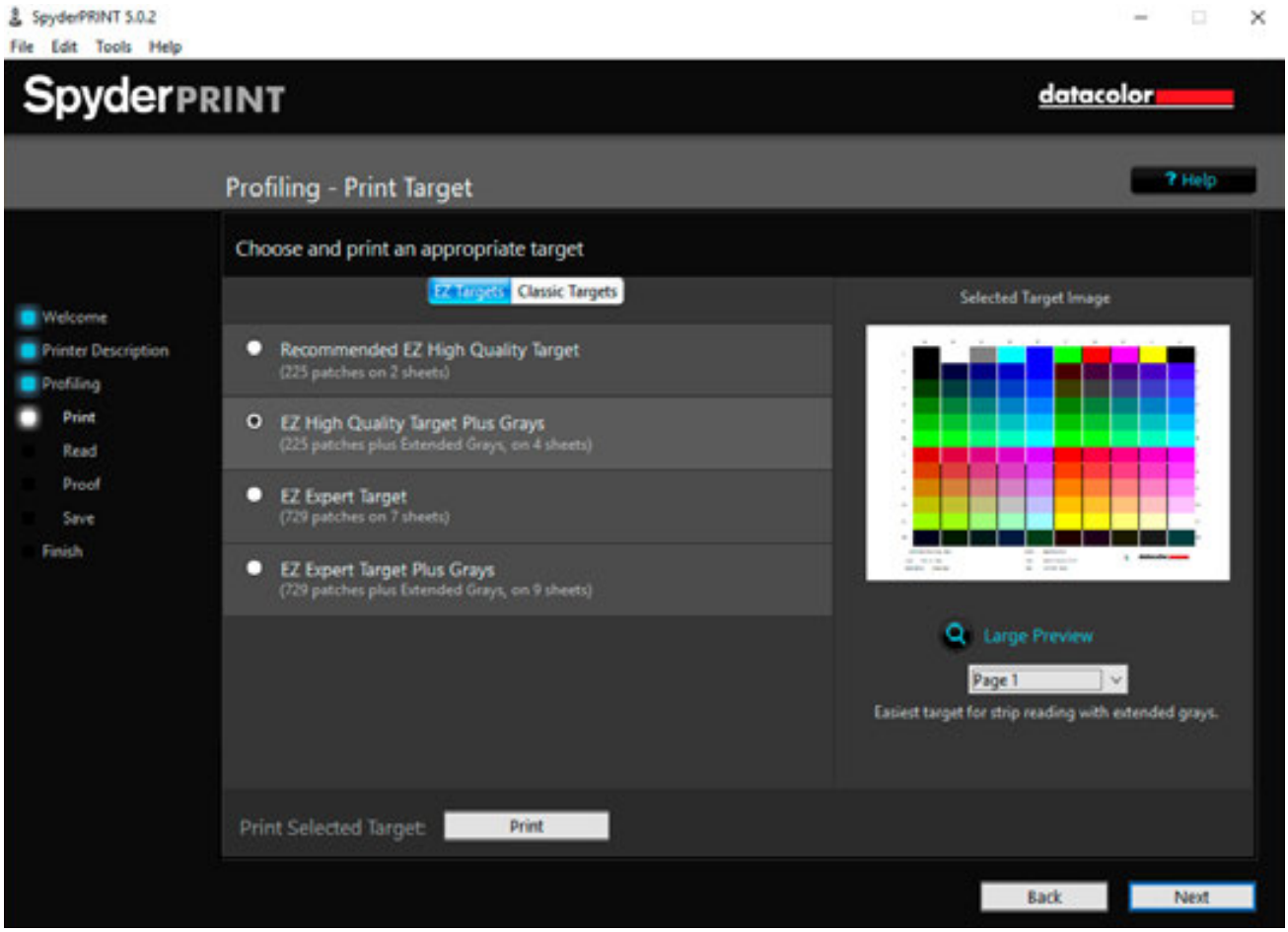
EXAMPLE

You may choose to work with an existing measurement file if you discover patch errors from incorrect measurements that you wish to correct, producing an improved profile.

Selection of Target Size

Choosing the number of patches

In this dialog you specify how many color patches will be used for profile creation. Most advanced users prefer profiles that are based on 729 fields. But 225 patches is fine for very linear printers. Fans of black-and-white prints should choose a target with the "extended gray scale" to improve neutrality in the near gray zone. "EZ targets" are prepared for faster strip reading with fewer errors. So-called "classic targets" are more suitable for reading one patch at a time, instead of in strip reading mode . This requires significantly more time, but saves paper.

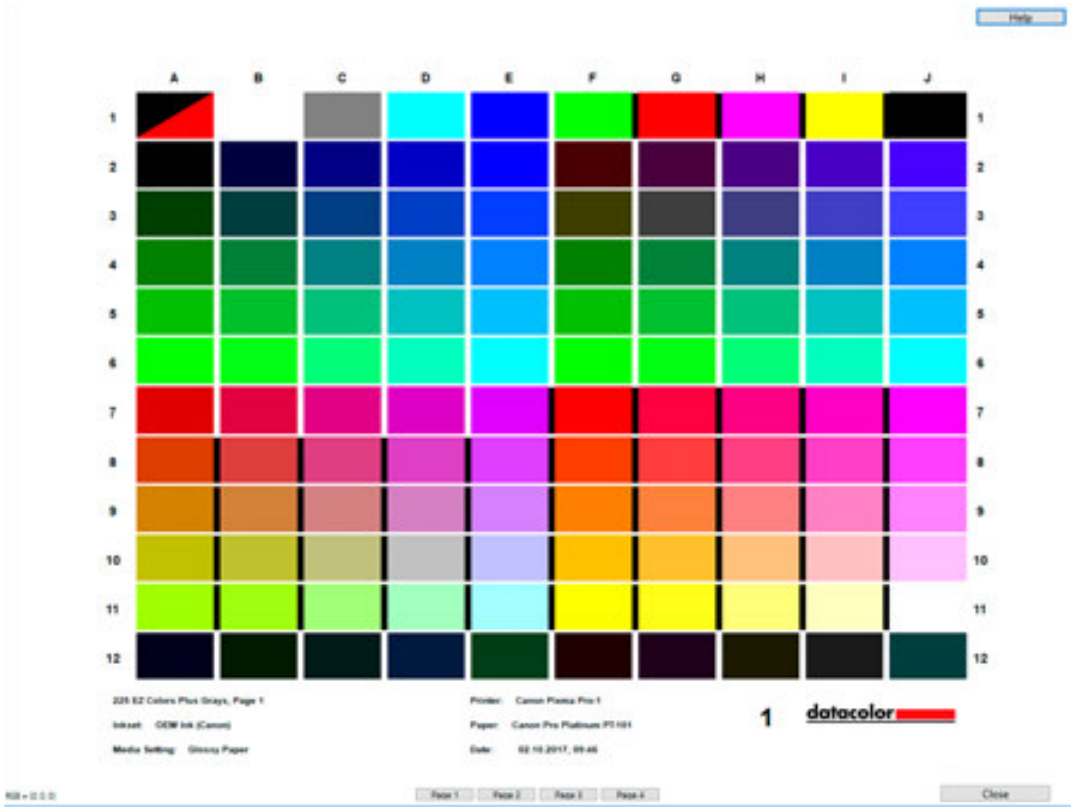


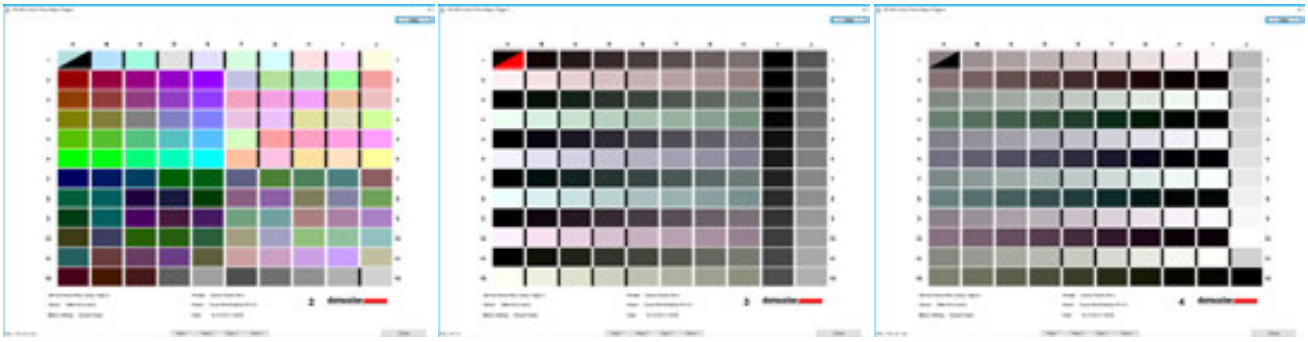
225 target patches will do for most use cases

Preview

Enables a visual check of targets

The preview function on the right side of the dialog box is very useful. You can use it to get an accurate picture of what each target pages looks like, at which setting. For example, to get an impression of the measuring ranges of the "extended gray scale", first select "page 3" . If you want to view other pages in this mode, you can use the buttons at the bottom of the menu to jump between the pages.





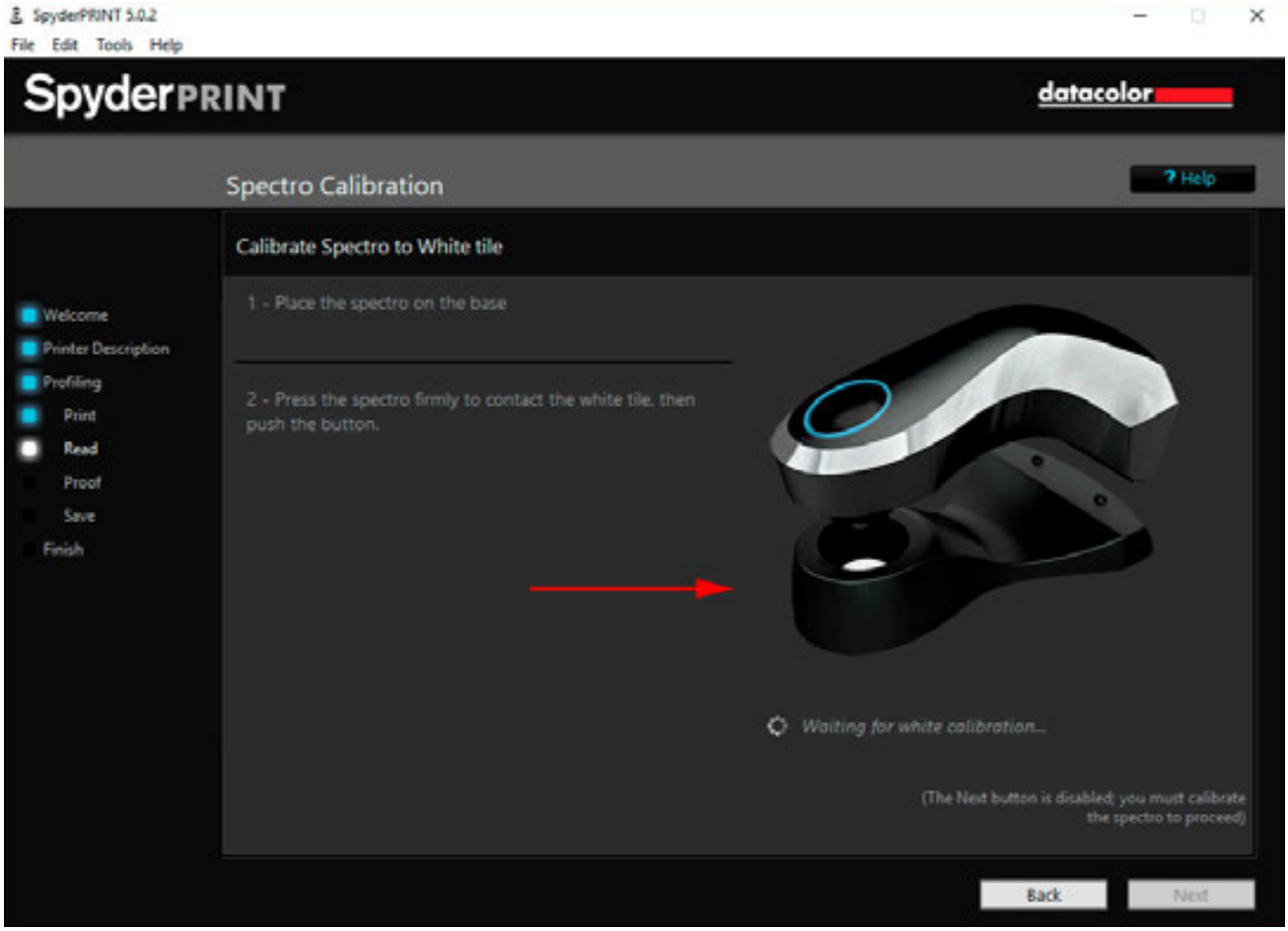
Test charts with 225 target patches

Device calibration

Follow this sequence

You must first calibrate the spectrocolorimeter before using it:

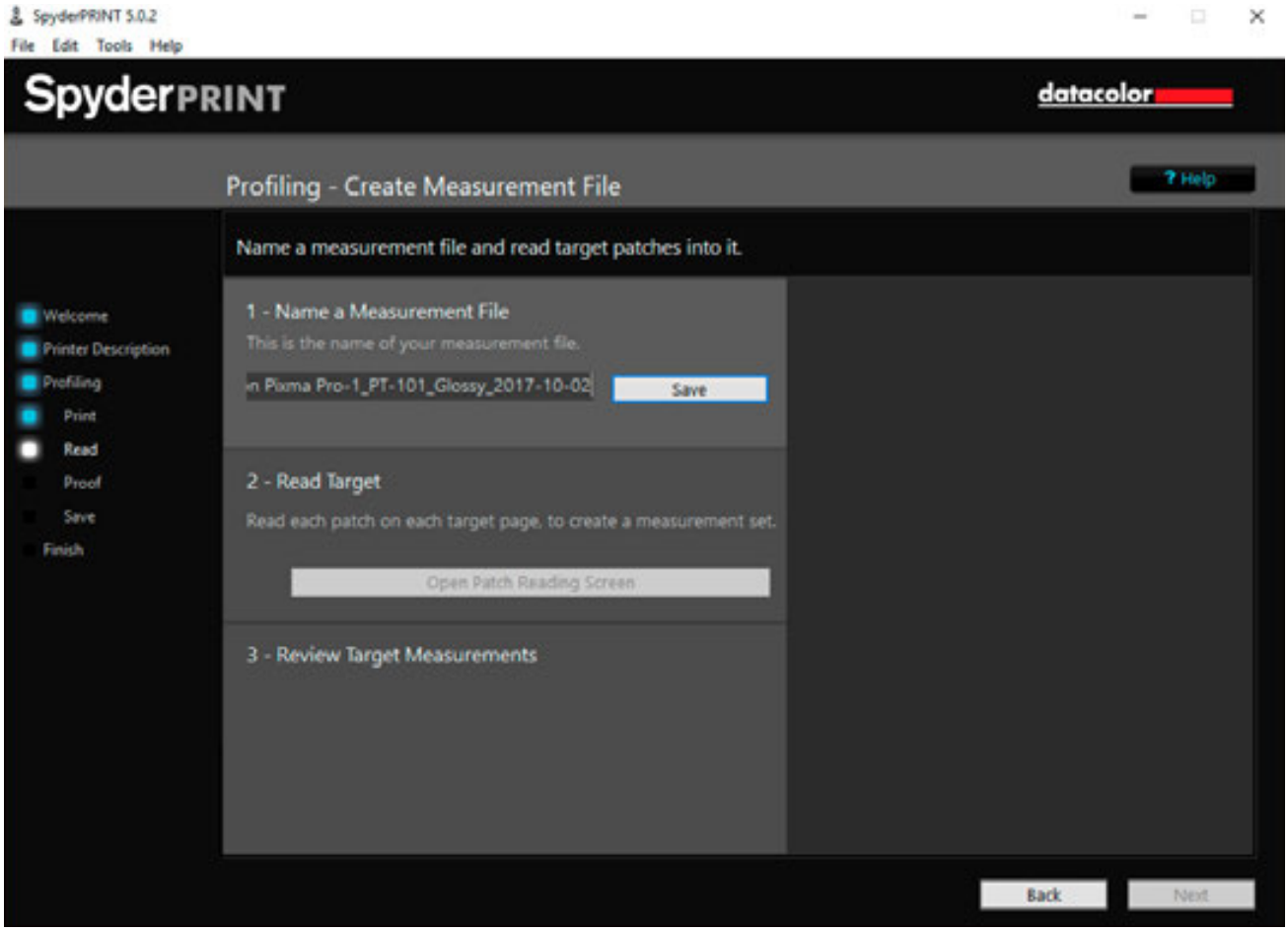
- Position it on the calibration bas provided
- Place the probe on the white calibration tile in the station
- Make sure that the rear part of the spectrocolorimeter rests flat between the plastic knobs for alignment
- Then, briefly press the switch once on the front of the device, while pressing the measuring nose into the opening of the calibration tile
- A “click“ sound confirms the completion of successful measurement



The user interface is intuitive and walks you through each step.

Measurement Backup

Before you measure the targets, you should define the name for the measurement file. The file is stored in SpyderPRINT's program directory in the XML format and can be accessed at any time for later profile building or measurement adjustments. In order to back up your measurement files in the long term, you should regularly include this folder in your system backup.



Entering a profile name

INFO

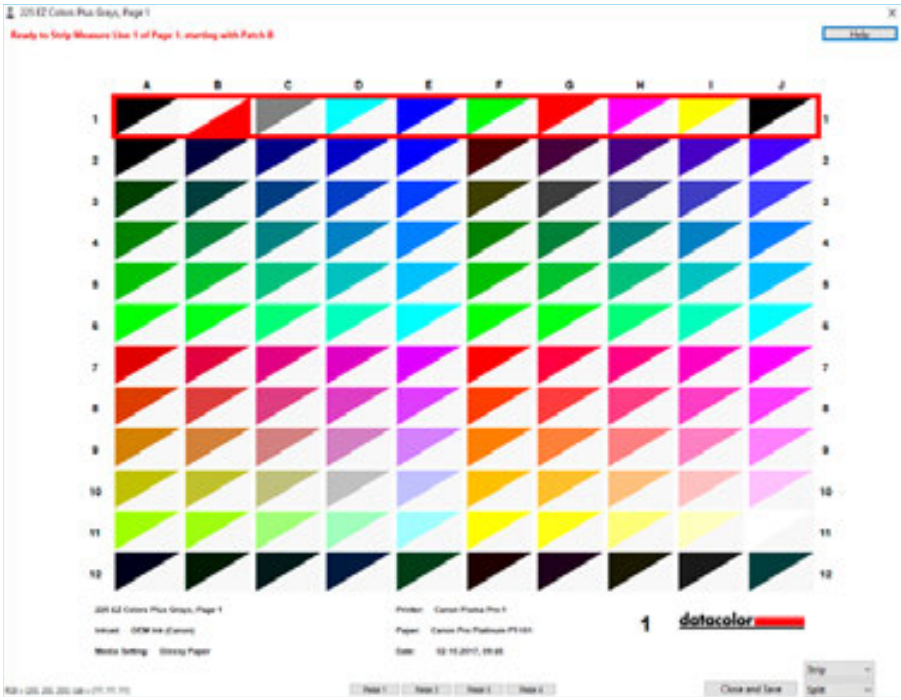
Note: In the application folder of SpyderPRINT only the lists with the measurement results are stored, not the color profiles themselves. However, the profiles can be easily recalculated using the XML measurement files.

All measurements carried out can be selected below the “Select existing measurement files“ menu item.

Measuring

How to get a brief tutorial

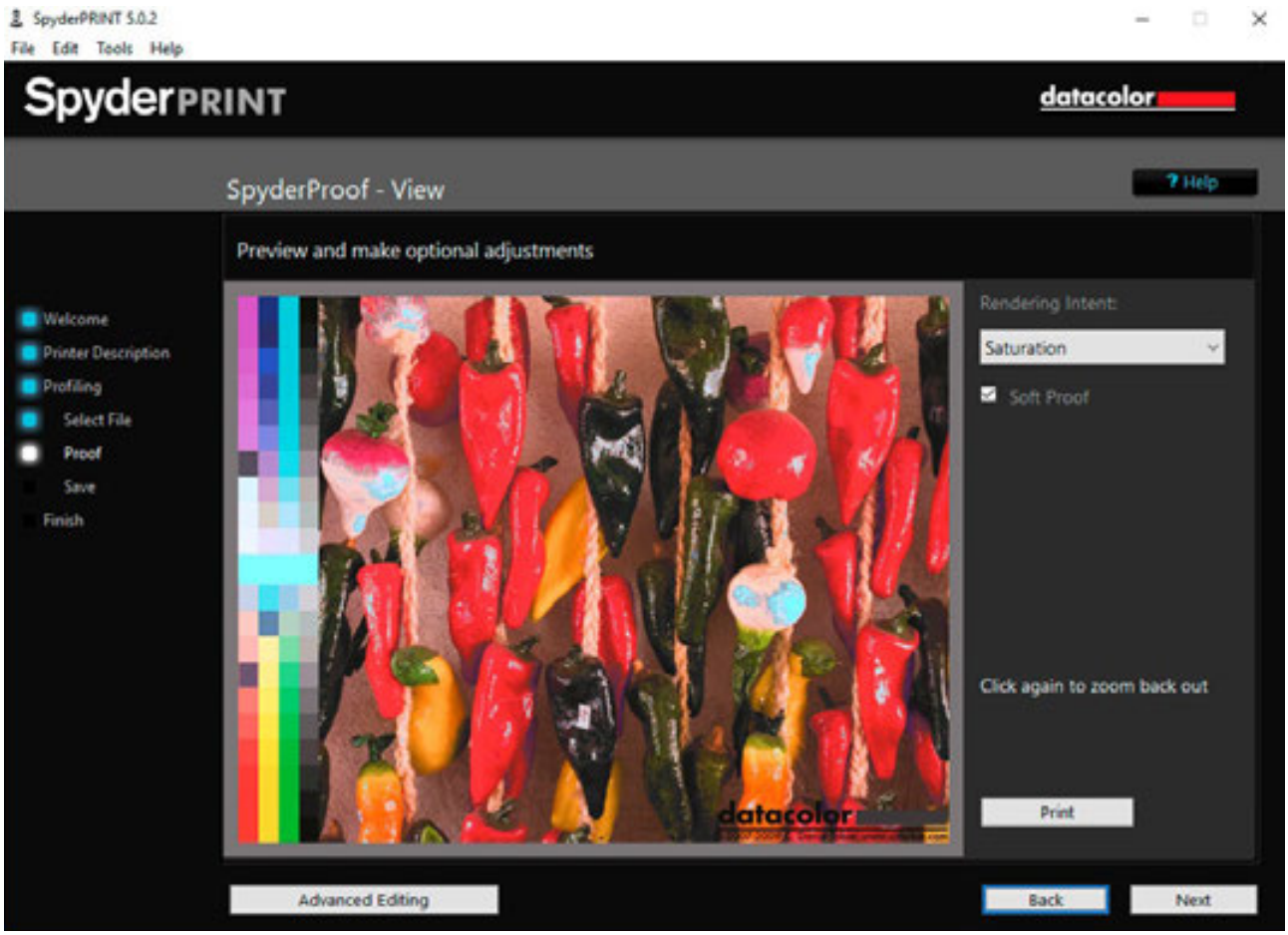
After clicking on the "Open Target Reading Screen" button, a software wizard asks you if you would like to be briefly instructed on strip reading technique. If this is your first time using the device, choose yes and watch the short animated demo. This shows you the technique and speed at which you move the spectro correctly over the target to avoid measuring errors.



SpyderProof

What options do you have?

You have the opportunity to print the SpyderProof test images, which are covered in the "Monitor Calibration" chapter with your newly created printer profile and various rendering intents.



Choose the rendering intent in the pull-down menu to your right

Rendering Intent

Rendering Intents are various ways of fitting the image color into the printer colorspace. The conversion of an image from one color space into another is called gamut mapping. For example, the printing color space tends to be much smaller than the RGB color space of a camera. Since the image was recorded in a large color space and has a range of colors that are not in the color space of the printing system, the goal is to convert the image so the same image in the new color space corresponds as well as possible to the original. For this reason, the ICC has defined four rendering intents for the most commonly used areas of application, which in turn are divided into two application-specific groups.

Division of rendering intents:

Re-purposing (other applications)	**Re-targeting (print output/proof)**
a. Saturation This intent is ideal for obtaining rich colors in presentations or charts. Datacolor also uses this intent for photographic images when color saturation is important; it maps primary colors directly to their ink tank color, for maximum vibrancy. b. Perceptual A perceptual compression from one color space to another is the goal here. However, due to a weakness in the ICC theory, color must be blindly compressed without knowledge of content or need, so Datacolor avoids perceptual compression, and uses this intent for a blend between Saturation and Colorimetric intents.	c. Absolute Colorimetric This method uses the mathematically closest match, without consideration of what they may look like. It leads to loss of detail in the case of colors outside the target color space, but precisely reproduces the colors that lie within the target color space. This method is usually used for emulating one printer or paper on another, such as press proofs. The white point is not adjusted. d. Relative Colorimetric The conversion here resembles the absolute colorimetric method. The paper white is included in the calculation to make it more flexible. This method can reduce accuracy losses in the conversion from larger to smaller color spaces, and is often set as default in image processing programs.

Which intent is the best?

There is no broad-brush response to this question. However, one can say as a rule that it depends on the color saturation of the initial image.

Relative Colorimetric lets you obtain moderately saturated colors and the pictures remain quite colorful. However, if there are strongly saturated colors, such as a blue sky in the image, the blue can quickly slip to a purple with this intent. In this case, moving to Perceptual should be tested. If colors still lack punch, move to the Saturation Intent.

INFO

Since the Perceptual Intent has flaws in its function, Datacolor has assigned a different calculation method to this intent. The Perceptual intent in the profiles of SpyderPRINT is based on a calculation method that is somewhere between Relative Colorimetric and Saturation.

INTERESTING ONLINE FINDS

You can find more information about rendering intents on Steve's Digicams Website.

Read Article

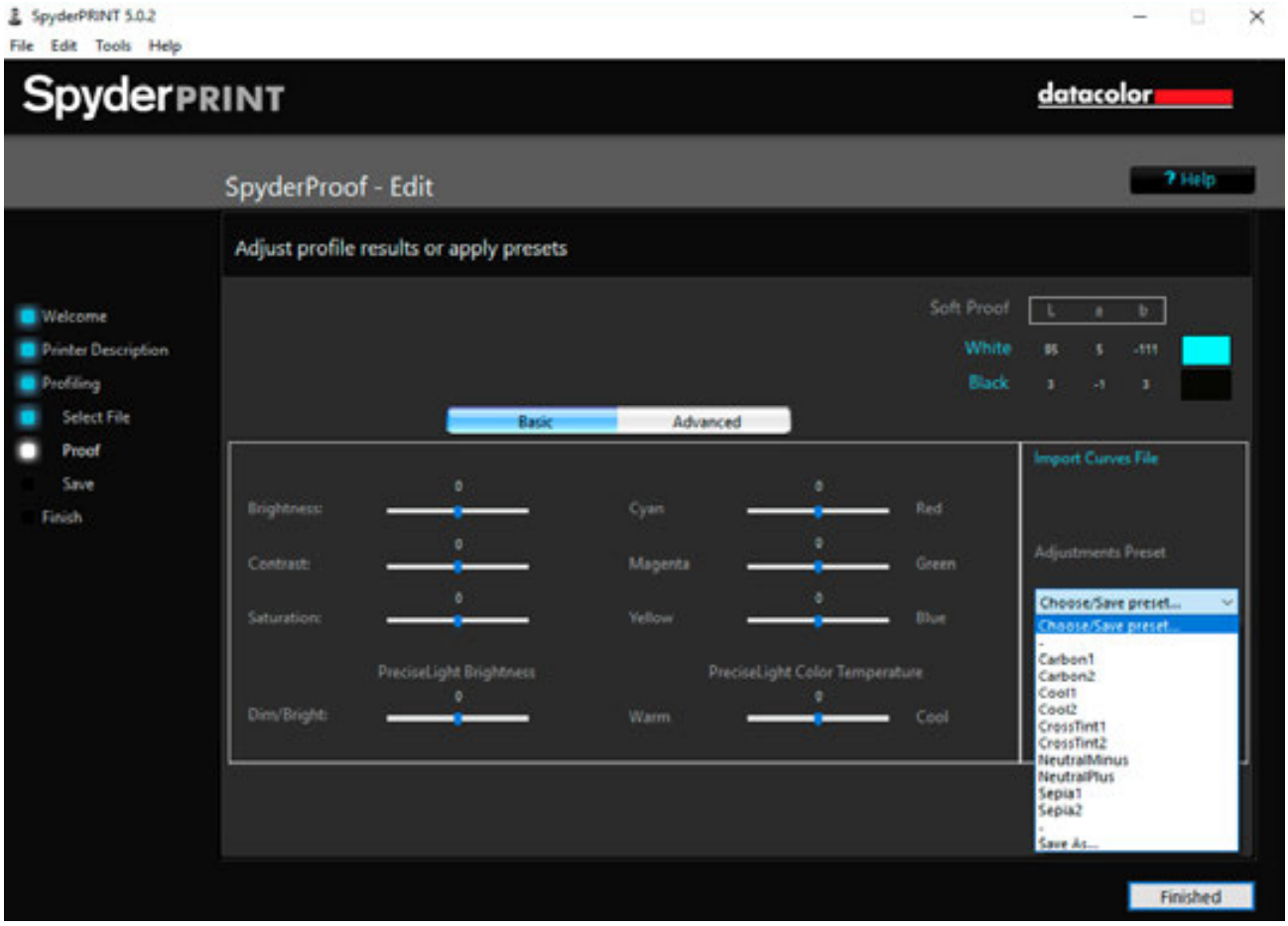
In addition, we would like to refer to Colorwiki for more detailed explanations on the rendering intent.

Read Article

Profile Setup

How to edit color profiles

You can modify the color profile by clicking the "Advanced Editing" button. On one hand, this is used to adjust images for special viewing environments, such as dark club rooms or cold neon lighting. But you can also make aesthetic adjustments, as the list of presets shows. There are some sepia tones or cross-tone effects. If you are interested in the options, you should click the online help section in the SpyderPRINT software. This provides complete information for each function.



SpyderProof – user interface to fine-tune a color profile

Glossary

AdobeRGB (1998):
The AdobeRGB color space was specified by Adobe in 1998. The objective was to create a color space from which the CMYK color space of a color printer could be adapted to the RGB color space of a monitor. It is larger than the sRGB color space.

Bayer filter:
Photo sensor named after its inventor Bryce E. Bayer. The sensor is overlaid with green, blue and red filters, which are in a ratio of 50 % green, 25 % blue and 25 % red. In this way, it approximates the sensitivity of the human eye, in which green accounts for the greatest share of the perception of brightness.

Border shadowing:
See objective vignetting.

CCFL display:
This is a first generation flat screen. CCFL stands for Cold Cathode Fluorescent Lamp. In contrast to today's monitors, which are illuminated with LEDs, the CCFL displays produce light using neon tubes.

Cd/Candela:
Candela is the SI unit of the SI basic variable of luminosity.

CEPS tools:
CEPS stands for Color Electronic Page Setting. In photography, this involves photo retouching or photo editing with the aid of image editing programs such as Adobe Photoshop or Adobe Lightroom.

CIE-xy color space:
The CIE standard valence system has been defined by the International Commission on Illumination (Commission internationale de léclairage). It is the link between human perception and physical causes.

CMOS technology:
CMOS stands for Complementary Metal Oxide Semiconductor. This involves semi-conductor technology, which has become widespread in photo sensors, etc. CMOS sensors are primarily characterized by low power consumption and short switching times.

Color balance:
The color balance determines the ratio of the colors to each other. For example, if the colors in a recorded image are not reproduced as they are in the original, the colors are not in balance.

Color fidelity:
Color fidelity is the measure of the deviation or the similarity of colors during recording and output. Color management systems are normally used to achieve maximum color fidelity.

Color fringes:
Color fringes, also called chromatic aberrations, occur in images because of deviations of optical lenses. Because the individual wavelengths of the visible spectrum in a lens are refracted differently, each wavelength range has its own focal point. In practice, this leads to color fringes, which are particularly visible on the contours and edges of an image. This error can be corrected using additional lenses, which are attuned to the respective wavelengths.

Color homogeneity:
The color homogeneity describes the color consistency or the color deviations from a set point over an area, e.g. the surface of a display. In the case of poor color homogeneity, the same color value is reproduced differently on the surface of the display. For example, this could cause a green tint on the upper right and a red tint on the bottom left corner.

Color noise:
Color noise, or image noise, describes the deterioration of image quality due to structures, which themselves do not carry any image information. The impacted image sections deviate from the actual image information in terms of color and brightness, and are especially visible in dark areas of the image in which the signal-to-noise ratio is very low.

Color separation:
In the prepress stage, this means the conversion of the colors of a wide variety of image datasets, mostly to the CMYK color model. The colors are separated into the print colors cyan, magenta, yellow and black.

Color space:
A color space is a defined range of colors. The best-known color spaces from the RGB color model are sRGB and AdobeRGB (1998), as well as the CMYK color model, Euroscale Coated v2, Fogra39 and ISO Coated v2.

Color temperature:
The color temperature describes the light mood and is specified in Kelvin. A cooler light mood (bluish) prevails, for example, in a cloudy sky, than in sunshine (yellowish).

Contrast:
Contrast is the ratio of the brightest to the darkest area of an image.

Contrast balance:
Is the ratio of the brightest and darkest areas and defines from where the light is being drawn.

Cross-effect:
The cross-effect originally came from analogue photography, in which a slide film was combined with a negative development process or a negative film with a reverse development. The colors are artificial and the contrasts are higher. This effect is often used for artistic styling and is imitated today by digital techniques.

Contrast ratio:
See contrast.

DLP projector:
DLP stands for Digital Light Processing and it is a technology developed by Texas Instruments where the image is created by an array of micro mirrors within the optical path. A special feature is that the red, green and blue pixels are not generated simultaneously (as in LCD projectors), but quick alternate flashing through a rotating color filter wheel.

Glossary

ECI RGB:
The ECI (European Color Initiative) RGB is a standardized RGB color space, which covers a large part of the printing processes, as well as all currently known display technologies. Thus, it is a color space that is designed especially for the needs of the graphic arts and prepress.

eciRGBv2:
Further development of ECI RGB. It has been optimized in terms of the visual equidistance, as is known from the CIE-L a*b* color space. This results in a minimization of banding and clipping errors, as with the L-Star color space. The ECI recommends using the color space as early as data creation, for example when converting RAW data or 16-bit material to 8-bit color depth.

EXIF information:
The Exchangeable Image File Format (EXIF) is a standard format for saving metadata in digital images. EXIF information can be, among other things, a camera model, shutter speed, ISO value, aperture or date and is written to the header of the image file.

Fine Art Printer:
There is no uniform definition for the term Fine Art Printing. All Fine Art printers attempt to create an image which most closely resembles a one-of-a-kind or work of art, in terms of its properties, selected motif, and post-editing, and in the use of the best photographic materials.

Gamma:
In relation to a monitor, gamma refers to the modulation of an input signal to a desired output signal. In practice, this means that a low-contrast image is obtained by correction of the output signal to contrast.

Gamut:
Is the description of the color range which can be reproduced by a technology or a technical device.

Gray balance:
"Achromatic" colors are the gray shades that lie between white and black. These are produced by equal proportions of the respective primary colors such as cyan, magenta and yellow (CMY) in the print or red, green, blue (RGB) in self-luminaires. If the primary colors change to equal proportions, a gray may become brighter or darker, but remains neutral gray. If the color components are no longer in the same proportion, one can immediately perceive a gray tint and gray balance is no longer maintained.

High-Key Image:
In high-key photography bright tones, few contrasts and soft light lend style to an image.

ICC profile:
An ICC profile describes the color space of input and output devices such as printers, scanners, digital cameras or monitors and refers to the reference values.

IPTC conventions:
IPTC is the acronym for International Press Telecommunications Council. As per the IPTC convention, metadata is saved to the header of an image file for improved classification. The metadata contains such things as parameters such as file format, file size, filename, height and width in pixels of a file, date recorded and the description of the contents.

Kelvin:
Kelvin is an SI unit of temperature measurement. It is also used for measuring the color temperature.

L*a*b* color space:
Is a device-independent color space and describes all perceivable colors equally, so that color deviations can be described by a Delta E.

LCD:
This refers to Liquid Crystal Display. The liquid crystals regulate the light impermeability per color channel. LED monitors are also LC displays, but irradiate the color filters from the rear with LEDs instead of fluorescent tubes.

LCD projectors:
The white light of the projector lamp is split into 3 basic colors by a prism and then sent through 3 LC displays, which control the image information per color channel. Subsequently, the image is put together by another prism. LCD projectors are characterized by a smaller contrast range, but can reproduce the colors very differently.

Low-pass filter:
With image files, so-called Moiré effects may occur instead of very fine recurring structures, which are at the limit of the sensor's resolution. These small, colored structures have a specific pattern, but are not part of the image information. Low-pass filters are used to prevent these phenomena.

L-Star RGB:
A modern color space, which combines the advantages of a higher color resolving power of the human visual sense of the CIE-LAB color space with the usual RGB color spaces like AdobeRGB and ECI-RGB. Banding and color tipper errors are reduced to a minimum when viewed on a display and in printing.

Luminance:
The luminance describes the brightness of image points
Luminance homogeneity:
Describes uniformity of brightness for a defined area. A poor luminance homogeneity of a monitor can be seen as vignetting, although all image areas must be equally bright.

LookUp table:
IT term. LookUp table (also called LUT) are tables in which application-specific values are stored which are used in a program routine.

Glossary

LUT:
See LookUp table.

Luv color space:
A color space that is calculated from the CIE-XY system, similar to the L*a*b* color space. This system is mainly used for the evaluation of light sources or monitors.

LED backlight:
This refers to a flat radiator that consists of many light emitting diodes and is used for the background lighting of an LED display.

Low-Key image:
In contrast to high-key photography, low-key photography uses little light as a stylistic device. Light is used consciously to accentuate highlight contours and the few details that are important for the image. Many sections of the image often remain in the dark. This lends a certain amount of drama to this type of image, a familiar sight in theatrical or stage photography.

Objective vignetting:
Vignetting refers to the shadowing of the image to its borders, which can be highlighted by components of the objective, such as lens mounts, and by filters or lens hoods. The effect itself is originally unwanted, but it is also used as a stylistic device.

Offset printing:
A printing method, in which the pressure roller does not directly contact the printed product, but the printing is transferred indirectly by a rubber roll. This is the most common method for printing books, newspapers, and packaging.

OSD:
Stands for On Screen Display and describes an input menu window of a monitor, which is shown on the display.

Primary colors:
Primary colors are the basic colors that compose secondary colors. Thus, the colors that a monitor can display are composed of the colors red, green and blue. The same applies to cyan/magenta/yellow, by means of which all colors which can be displayed by the process are mixed in printing.

Polarization layer:
A polarization layer, as used in LE and LC displays, ensures that light is polarized, which means only the fractions that oscillate in a plane are transmitted. This is the prerequisite for the option of regulating the light quantity per pixel with LCs.

Reflection idiosyncrasies:
Printing paper and photo paper have a large number of surface properties. The bandwidth ranges from matte and glossy to a wide variety of textures and materials. Every surface and material has very specific characteristics, with regard to how they absorb and reflect light. These must be taken into consideration when setting up a color workflow.

Rendering Intent:
The way in which the colors must be converted from one color model into another.

Softproof:
In a softproof, the colors on a monitor are simulated as they will appear on the selected output material. Also know as ink color simulation.

sRGB:
Standard RGB is also a color space developed by Hewlett-Packard and Microsoft. It is widespread, but smaller than the AdobeRGB (1998) color space.

THM file:
THM files are miniature view video files, which are used to create a thumbnail image (miniature image) of the video file for improved orientation.

Tonal value:
The tonal value describes the measure of tone scales. For example, a digital camera with 8 bits per color channel has a tonal value reduction of 28 = 256 steps per color channel.

White balance:
In the case of a white balance, a camera should be set to the color temperature of the recorded scene to keep the color balance neutral. This is also done by the human eye, which evaluates colors in a largely neutral manner.

White luminance:
White luminance is the maximum brightness of a white point that can be displayed by a monitor.

White point:
The white point defines the white of a monitor with full control.

Wide gamut:
Gamut is the displayable color space of a monitor. Wide gamut features a device class that is characterized by a very large color space that is close to AdobeRGB (1998) or even slightly more. Monitors with wide gamut are typically used in image editing.

Workflow:
A workflow in photography includes all devices and technologies, which are used in the processing of the final image. A typical workflow includes a digital camera, image editing software, display units/monitors, and printers.

Spyder5 eBook

Color management can be easy

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